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######

```matlab
m1 = 0.27;% #####
m2 = 3.6; % ####
n = 9; % ##
d1 = 0.21; %####
d2 = 0.4; % ####
h1 = 0.22;% ###
g = 9.7947; % #####
HH1 = 0.40; % ####
L = 1.7; % ########

% ######
c = 0.5;
rho = 1.29;
S = 4 * pi * (d1/2)^2;
k = 1/2 *c*rho * S;
f_air = @(v)1/2 *c*rho * S * v.^2;
```

#########

```matlab
v_ball = @(x)sqrt(m1*g/k)*sqrt(exp(2*k*x/m1)-1)/(exp(k*x/m1));
% $$x(t)=\frac{mlog(cosh(\sqrt{\frac{gk}{m}}))}{k}$$
```

##########

#########

```matlab
function [v11,v22] = Crash(v1,v2,m1,m2)
    v11 = ((m1-m2)*v1+2*m2*v2)/(m1+m2);
    v22 = ((m2-m1)*v2+2*m1*v1)/(m1+m2);
end
```

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